

POWER, ENERGY, AND TRANSPORTATION TECHNOLOGY II
(Revised) AUGUST 2007
COURSE NUMBER 771

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Name of Course: Power, Energy, and Transportation Technology II
Level of Course: Academic Level I
Prerequisites: Power, Energy, and Transportation I
Grades Levels Offered to: 10 through 12
Course Number: 771
Number of Credits: 5
Revised Date and Teachers Names: Mr. Brian J. Drelick (August 2010)

Purpose:

This second level Power, Energy, and Transportation Technology course will continue to provide our students with the hands on practical knowledge of how these vital systems within our society are constructed and operate. Studying modes of transportation and then applying these concepts in order to solve real life problems will provide students with a better understanding of how real world situations are addressed. Furthermore, with different forms of energy and power emerging here in the 21st Century, our students will be introduced to both the advantages and disadvantages of these new systems and how they differ from the traditional forms while concurrently completing activities which pertain to them.

This course concentrates on a wide range of technological areas related to power, energy, and transportation, specifically air transportation and alternative forms of energy. The emphasis will continue to be on hands on, problem solving activities in which students work together in lab activities designed to reinforce the content presented. (Activities present information on alternate energy and power systems including solar, hydroelectric, wind, mechanical, electrical, and fluid power.) After having studied in depth land and marine transportation during the first year of the course, a strong emphasis will now be placed on a variety of modes of air and aerospace transportation. High Point Regional High School's curriculum and instruction are aligned to the State's Core Curriculum Content Standards and address the elimination of discrimination by narrowing the achievement gap, by providing equity in educational programs and by providing opportunities for students to interact positively with others regardless of race, creed, color, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, religion, disability or socioeconomic status.

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General Objectives:

At the conclusion of this course, the students will be able to:

1. Define technology.
2. Describe technology as a system.
3. List, describe, and implement the steps in the design process.
4. Identify how different systems components within transportation, energy, and power systems operate.
5. Utilize a variety of different forms of presentation techniques.

6. Define energy and different sources of renewable and non-renewable energy.
7. Describe the importance of energy as an input to all technology systems.
8. Explain how energy technology can make our lives better, and how energy technology can cause damage.
9. Define transportation and transportation technology.
10. List and describe the parts of a transportation system.
11. Describe transportation as a technological system within our society.
12. Define power and identify with the three basic power systems.
13. Understand the different uses of energy in transportation.
14. Define aircraft.
15. Describe the airways system.
16. Identify the basic structure of an airplane.
17. Discuss and describe how an aircraft flies.
18. Identify several air transportation vehicles.
19. Identify the support systems of air transportation.
20. Describe the two modes of air transportation.
21. Introduced the significance of the single propeller plane.
22. Apply various forms of propulsion to different aircraft systems.

Measurement of success in meeting these general objectives will be carried out through the following methods of assessment:

Classwork/Homework	Objectives 4, 10, 13
Quizzes	Objectives 1, 2, 11, 19, 21
Tests	Objectives 6, 8, 9, 12, 14, 18
Projects/Labs	Objectives 3, 16, 17, 22
Class Participation	Objectives 5, 7, 15, 20

Method of Instruction - Standards Targeted Throughout the Curriculum

New Jersey Core Content Standards - Career, Science, and Technology

Career Education and Consumer, Family and Life Skills STANDARD 9.2 (Consumer, Family, and Life Skills) All students will demonstrate critical life skills in order to be functional members of society.

A. Critical Thinking

1. Apply communications and data analysis to the problem-solving and decision making processes in a variety of life situations.
2. Describe and apply constructive responses to criticism.
3. Apply the use of symbols, pictures, graphs, objects, and other visual information to a selected project in academic and/or occupational settings.
4. Apply knowledge and skills needed to use various means of transportation within a community.

B. Self-Management

1. Apply project planning and management skills in academic and/or occupational settings.

C. Interpersonal Communication

1. Model interpersonal and effective conflict resolution skills.
2. Communicate effectively in a variety of settings with a diverse group of people.

Science STANDARD 5.4 (Nature and Process of Technology) All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.

A. Science and Technology

1. Know that scientific inquiry is driven by the desire to understand the natural world and seeks to answer questions that may or may not directly influence humans, while technology is driven by the need to meet human needs and solve human problems.

B. Nature of Technology

2. Assess the impacts of introducing a new technology in terms of alternative solutions, costs, tradeoffs, risks, benefits and environmental impact.

C. Technological Design

3. Plan, develop, and implement a proposal to solve an authentic, technological problem.

Technological Literacy STANDARD 8.1 (Computer and information literacy) All students will use computer applications to gather and organize information and to solve problems.

A. Basic Computer Skills and Tools

1. Create a multi-page document with citations using word processing software in conjunction with other tools that demonstrates the ability to format, edit, and print.
2. Produce a multimedia project using text, graphics, moving images, and sound.
3. Produce and edit page layouts in different formats using desktop publishing and graphics software.
4. Discuss and/or demonstrate the capability of emerging technologies and software in the creation of documents or files.

B. Application of Productivity Tools

Social Aspects

1. Describe the potential and implications of contemporary and emerging computer applications for personal, social, lifelong learning, and workplace needs.
2. Exhibit legal and ethical behaviors when using information and technology, and discuss consequences of misuse.
3. Make informed choices among technology systems, resources, and services in a variety of contexts.
4. Use appropriate language when communicating with diverse audiences using computer and information literacy.

C. Information Access and Research

1. Select and use specialized databases for advanced research to solve real world problems.
2. Identify new technologies and other organizational tools to use in personal, home, and/or work environments for information retrieval, entry, and presentation.
3. Evaluate information sources for accuracy, relevance, and appropriateness.

D. Problem Solving and Decision Making

1. Create and manipulate information, independently and/or collaboratively, to solve problems and design and develop products.
2. Identify, diagnose, and suggest solutions for non-functioning technology systems.
3. Identify a problem in a content area and formulate a strategy to solve the problem using brainstorming, flowcharting, and appropriate resources.
4. Integrate new information into an existing knowledge base and communicate the results in a project or presentation.

Technological Literacy STANDARD 8.2 (Technology Education) All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual, society, and the environment.

A. Nature and Impact of Technology

1. Use appropriate data to discuss the full costs, benefits and trade-offs, and risks related to the use of technologies.
2. Explain how technological development is affected by competition through a variety of management activities associated with planning, organizing, and controlling the enterprise.
3. Provide various examples of how technological developments have shaped human history.

B. Design Process and Impact Assessment

1. Analyze a given technological product, system, or environment to understand how the engineering design process and design specification limitations influenced the final solution.
2. Evaluate the function, value, and appearance of technological products, systems, and environments from the perspective of the user and the producer.
3. Develop methods for creating possible solutions, modeling and testing solutions, and modifying proposed design in the solution of a technological problem using hands-on activities.
4. Use a computer assisted design (CAD) system in the development of an appropriate design solution.
5. Diagnose a malfunctioning product and system using appropriate critical thinking methods.
6. Create a technological product, system, or environment using given design specifications and constraints by applying design and engineering principles.

C. Systems in the Designed World

1. Explain the life cycle of a product from initial design to reuse, recycling, remanufacture, or final disposal, and its relationship to people, society, and the environment, including conservation and sustainability principles.
2. Analyze the factors that influence design of products, systems, and environments.
3. Compare and contrast the effectiveness of various products, systems, and environments associated with technological activities in energy, transportation, manufacturing, and information and communication.

Standards of Technological Literacy from the Technology (STL) for All Americans Project and the International Technology Education Association (ITEA)

- In order to comprehend the scope of technology, students should learn that technology is closely linked to creativity, which has resulted in innovation. (STL #1, H)
- In order to recognize the core concepts of technology, students should learn that systems thinking involves considering how every part relates to others. (STL #2, N)
- In order to comprehend the attributes of design, students should learn that there is no perfect design. (STL #8, F)
- In order to comprehend the attributes of design, students should learn that the requirements for a design are made up of criteria and constraints. (STL #8, G)
- As part of learning how to apply design processes, students should be able to make two-dimensional and three-dimensional representations of the designed solution. (STL #11, J)

- In order to select, use, and understand information and communication technologies, students should learn that the use of symbols, measurements, and drawings promotes clear communication by providing a common language to express ideas. (STL #17, K)

Source: International Technology Education Association (2000). *Standards for Technological Literacy*. Reston, VA: ITEA. ISBN 1-887101-02-0

Benchmarks of Project 2061

- Almost all control systems have inputs, outputs, and feedback. The essence of control is comparing information about what is happening to what people want to happen and then making appropriate adjustments. This procedure requires sensing information, processing it, and making changes. In almost all modern machines, microprocessors serve as centers of performance control. (Project 2061, #1)
- What use can be made of a large collection of information depends upon how it is organized. One of the values of computers is that they are able, on command, to reorganize information in a variety of ways, thereby enabling people to make more and better uses of the collection. (Project, 2061, #3)

Specific Behavioral Objectives and Timelines:

Unit 1: Course Introduction and Safety Guidelines

Time: 3 days

Goal:

- To introduce the students to the course expectations, discipline policy, and safety guidelines.

Objectives:

- Outline the course expectations and timeline for instruction.
- Discuss the specific discipline policy that relates to behavior in this class.
- Outline the specific safety guidelines of the classroom.

Audio-Visual Needs:

- Overhead projector
- Movie “UVEX PPE Eyewear Training Video/Technology Department Eye Safety”

Computer Needs/Use: None

Assignments:

- Movie related worksheet

Lab Activities: None

Assessment Method:

- Safety Quiz

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2

Unit 2: Review - Technology

Time: 3 Days

Goal:

- Review with the students the systems of technology education and technological literacy.

Objectives:

- Discuss technology.
- Review the difference between science and technology.
- Discuss technology as a system, and list and explain the components of these systems.
- Discuss the positive and negative impacts of different technological systems.
- Review the design loop and its impact on technological problem solving.
- Review the presentation techniques of formal documentation used in previous years.

Audio-Visual Needs:

- Previous examples of student work
- SmartBoard technology
- Movie “The Design Process”
- Text: Hutchinson, J. and Karsnitz, J. (1994). *Design and Problem Solving in Technology*. Albany: Delmar Publishers, Inc.

Computer Needs/Use:

- None

Assignments:

- Homework: *The Design Loop*

Lab Activities:

- None

Assessment Method:

- Authentic: *Teacher Observation*
- Traditional: *Introduction to Technology Quiz*

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #1, H
- STL #2, N
- STL #8, F

Unit 3: Review – Power, Energy, and Transportation/Design Process Time: 5 Weeks

Goal:

- Review with the students to the importance of power, energy, and transportation and the implementation of the design process in today’s society and technology’s impact on transportation systems.

Objectives:

- Based on the knowledge acquired in Power, Energy, and Transportation I, the students will:
 - Implement the steps in the design process.
 - Utilize a variety of forms of presentation techniques.
 - Apply acquired knowledge into the development of a working prototype.
 - Implement the teamwork performance model to maximize group efficiency.
 - Introduce a variety of different materials for usage and processing.

Audio-Visual Needs:

- Overhead projector
- Photos
- SmartBoard technology

Computer Needs/Use:

- Student Internet research
- Documentation development

- Word/Publisher
- Digital Camera
- Student presentation using SmartBoard

Assignments:

- Classwork: *Developing strong Oral Presentations*
- Classwork: *Group Evaluations*

Lab Activities:

- Design Brief: *Design and develop your version of the Wright Bat using the design process and with application of your knowledge from last year.*

Assessment Method:

- Authentic: Comprehensive documentation, teacher observation, teamwork performance, student self and group assessment, daily logs
- Traditional: Class participation

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #1, H
- STL #8, F
- STL #8, G
- STL #11, J
- Project 2061, #3

Unit #4: Review – Land and Marine Transportation

Time: 1 Week

Goal:

- Review the major concepts discussed and explored in Power, Energy, and Transportation I and the transportation systems that we worked with

Objectives:

- Review how different systems and components within transportation, energy, and power systems operate.
- Review the means by which information was presented.
- Review how technology has positively and negatively impacted different transportation techniques.
- Propose ways in which the students could use their previously acquired knowledge to help them in the upcoming year.

Audio-Visual Needs:

- Various websites
- Examples of student work
- Smartboard technology

Computer Needs/Use:

- Internet research
- Microsoft PowerPoint

Assignments:

- *Review Worksheet*

Lab Activities:

- *None*

Assessment:

- Authentic: Teacher observations
- Traditional: Classwork, Quiz

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #8, G
- Project 2061, #1

Unit #5: Introduction to Air Transportation

Time: 3 Weeks

Goal:

- Introduce the students to the major concepts and factors involved with past, present, and future air transportation systems.

Objectives:

- Define the components necessary to designate a vehicle an “aircraft”.
- Identify the basic structure of an airplane
- Identify the three basic movements of an airplane: roll, pitch, yaw
- Examine the history of air transportation, with a specific focus on the Wright Brothers and the evolution of aeronautic transportation.
- Discuss the guidance, control, and structural systems of air transportation vehicles.
- Discuss the forces involved in flight.
- Discuss potential careers and the future of air transportation.

Audio-Visual Needs:

- Demonstration tools
- Movie “Wright Brothers”
- SmartBoard technology via the Internet

Computer Needs/Use:

- Student Internet research

Assignments:

- Classwork reviewing information
- Homework reviewing information
- Test Review

Lab Activities:

- None

Assessment Method:

- Authentic: Teacher observation
- Traditional: Class participation, Classwork/homework, quiz

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #2, N

Unit #6: Design Project: Preliminary Air Transportation

Time: 8 Weeks

Goal:

- The students will apply their acquired knowledge in order to complete a comprehensive design and problem solving activity.

Objectives:

- Implement the steps in the design process.
- Utilize a variety of forms of presentation techniques.
- Apply acquired knowledge into the development of a working prototype.
- Implement the teamwork performance model to maximize group efficiency.
- Introduce a variety of different materials for usage and processing.

Audio-Visual Needs:

- SmartBoard technology
- Examples of student work
- Internet

Computer Needs/Use:

- Student Internet research
- Documentation development
- Word/Publisher
- Digital Camera
- Student presentation using SmartBoard

Assignments:

- Classwork/homework to reinforce concepts
- Interim due dates
- Oral presentations

Lab Activities:

- Situation: *Design and develop a series of air transportation vehicles that will meet a series of specifications, limitations, and requirements using a variety of different materials.*

Assessment Method:

- Authentic: Comprehensive documentation, teacher observation, teamwork performance, student self and group assessment, daily logs
- Traditional: Class participation

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #1, H
- STL #8, F
- STL #8, G
- STL #11, J
- Project 2061, #3

Unit #7: Review - Alternate Energy

Time: 1 Week

Goal:

- Review with the students the prominent forms of alternate energy, their uses, and technology's impact on their function and the environment especially as they relate to different forms of air and space transportation.
- Use resources and materials acquired during the energy audit to continue confirmation of the need for alternative energy

Objectives:

- Discuss renewable energy sources.
- Identify the basic sources of renewable energy.
- Discuss the importance of energy as an input to all technology systems.
- Explain how energy technology can make our lives better, and how energy technology can cause damage based upon the knowledge acquired in Power, Energy, and Transportation I.

Audio-Visual Needs:

- SmartBoard technology

- Examples of Student Work

Computer Needs/Use:

- None

Assignments:

- Classwork reviewing previously discussed information

Lab Activities:

- Discussion of the energy audit

Assessment:

- Authentic: Teacher observation
- Traditional: Quiz/Test, class participation

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2

Unit #8: Alternate Energy Activity – Air Transportation

Time: 4 Weeks

Goal:

- The students will apply a different form of propulsion to an air transportation system .

Objectives:

- Understand and apply the positive, negative, and financial effects of alternative energy.
- Test and evaluate a previous design in order to improve and expand upon what has already been done.
- Apply the previously acquired knowledge of computer design software to make the necessary and appropriate changes.
- Suggest ways in which this form of alternate energy has or can ease potential energy problems that face the United States or a particular form of air transportation.
- Rationalize design options for appropriateness and cost.
- Utilize a variety of different presentation and propulsion techniques.

Audio-Visual Needs:

- Internet sites via SmartBoard technology
- Examples of student work
- Computers to access computer design software

Computer Needs/Use:

- Internet research
- Abbreviated documentation development
- Presentation tool
- PTC Pro-Desktop

Assignments:

- Re-design rationale
- Interim progress checks

Lab Activities:

- Design a powered air transportation system that will meet a series of different specifications, requirements, and limitations. The students will be encouraged to implement a form of alternative form of energy into the prototype or design process.

Assessment Method:

- Authentic: Teacher observation, student documentation
- Traditional: Quiz, class participation, re-design

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2

- STL #1, H
- STL #8, G
- STL #11, J
- Project 2061, #1

Unit #9: Air Transportation Activity – Flight Endurance

Time: 8 Weeks

Goal:

- The students will apply their acquired knowledge to design and develop a comprehensive aeronautical transportation vehicle.

Objective:

- List, describe, and implement the steps of the design process in order to develop a comprehensive documentation portfolio.
- Utilize a variety of different forms of presentation techniques.
- Apply the importance of guidance, control, propulsion, and structural systems to the effectiveness of the aerospace transportation vehicle.
- Apply various concepts within energy and power to the structural design and development of this prototype.

Audio-Visual Needs:

- Internet resources via SmartBoard technology
- Models and previous examples
- Overhead projectors
- Annotated and developmental orthographic and isometric drawings

Computer Needs/Use:

- Word/Publisher for documentation development
- Digital camera
- Extensive Internet usage
- E-mail correspondence

Assignments:

- Classwork/homework
- Interim due dates
- Class presentations
- Complete documentation development

Lab Activities:

- Design and develop a aerospace transportation vehicle and the completion of a comprehensive documentation portfolio.

Assessment:

- Authentic: Teacher observation, documentation portfolio, teamwork performance, daily journals, cooperation, time management
- Traditional: Class participation, Classwork

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #1, H
- STL #8, F
- STL #8, G
- STL #11, J
- STL #17, K
- Project 2061, #3

Unit #10: Air Transportation Activity – Electronic Aviation

Time: 8 Weeks

Goal:

- The students will apply their acquired knowledge to design and develop a comprehensive aeronautical transportation vehicle.

Objective:

- List, describe, and implement the steps of the design process in order to develop a comprehensive documentation portfolio.
- Utilize a variety of different forms of presentation techniques.
- Research the mechanical factors involved with aircraft, including symmetry, propulsion, and the aerodynamic lift.
- Apply the importance of guidance, control, propulsion, and structural systems to the effectiveness of the aerospace transportation vehicle.
- Apply various concepts within energy and power to the structural design and development of this prototype.

Audio-Visual Needs:

- Internet resources via SmartBoard technology
- Models and previous examples
- Overhead projectors
- Annotated and developmental orthographic and isometric drawings

Computer Needs/Use:

- Word/Publisher/PowerPoint for documentation development
- Digital camera
- Extensive Internet usage
- E-mail correspondence

Assignments:

- Classwork/homework
- Interim due dates
- Class presentations about the original usage of their chosen aircraft
- Complete documentation development

Lab Activities:

- Design and develop a scaled down air transportation vehicle using the appropriate propulsion, materials, and assembly from the materials provided, and the completion of a comprehensive documentation portfolio.

Assessment:

- Authentic: Teacher observation, documentation portfolio, teamwork performance, daily journals, cooperation, time management
- Traditional: Class participation, Classwork

Standards targeted via this unit:

- NJCCCS 9.2, 5.4, 8.1, 8.2
- STL #1, H
- STL #8, F
- STL #8, G
- STL #11, J
- STL #17, K
- Project 2061, #3

Materials/Resources:

Text: None

Labs:

- Introduction to Aviation
- Introduction to Preliminary Flight
- Real World Application to Alternative Energy Activity
- Introduction to Flight Endurance
- Introduction to Electronic Aviation

People: None

Audio-Visual:

- SmartBoard technology
- Presentation techniques
- Series of movies
- Multiple models
- Previous student work
- Pertinent publications
- Information from United States transportation and energy agencies.

Assessment:

The assessment of student progress in the objectives cited on the previous pages will be primarily by, but not limited to, the following criteria.

Classwork/Homework	10%
Quizzes	10%
Tests	15%
Projects/Labs	35%
Class Participation	30%

Midterm and final exams last updated 2011

Periodic evaluation of objectives and this curriculum guide:

With the evaluation of a new text every five years, administration requests a curriculum re-write in: **2015**

Special Course Policies:

Success in this course will be based on a variety of factors, however the instructor will most directly assess the student's performance in comprehensive design and problem solving activities, teamwork performance, and class participation as the means of determining a grade. A typical week in class will consist of formal instruction on a variety of material, students working in groups to complete work pertaining to the lecture, research and development, teamwork to generate possible solutions to and solve problems, and in some cases the development of different products and prototypes. Quizzes and tests will be given to re-emphasize and assess the student's understanding of the presented information.

Supplementary Readings and Instructors Bibliography:

Johnson, Stephen R. Exploring Transportation. (Goodheart-Wilcox Company, Tinley Park, Illinois). 2000. ISBN 1-56637-675-0.

Smith, Howard. Understanding Technology. (Goodheart-Wilcox Company, Tinley Park, Illinois). 1998. ISBN 1-56637-374-3.

Wright, Thomas. Technology Systems. (Goodheart-Wilcox Company, Tinley Park, Illinois). 1966. ISBN1-56637-263-1.

Homework, Extra Credit Policy:

Due to the periodic nature of homework in this course, homework will be not be accepted late unless a legitimate excuse exists. Extra credit will be available during the design and problem solving activities in the form of additional research/development and competitive events.

Web pages that support learning:

www.energy.gov
www.nasa.gov
www.firstflight.org
www.dot.gov
www.teanj.com
www.iteawww.com

Lab/Classroom set up and special needs:

This course will be taught implementing a variety of different and state of the art instructional technologies such as:

- Multiple computers
- Multiple workbenches
- SmartBoard technology
- Projection screen and device
- Electrical outlets
- Testing area
- Teamwork areas
- Scanner and digital cameras